

SONY®



SRW-9000

HDCAM SR Camcorder

HDCAM SR™

CINE ALTA™

CineAlta gear: driving digital cinematography



In 2000, Sony created the world's first digital camcorder to combine the detail of high definition, the clarity of progressive scanning and the cherished look of 24 frames per second motion. This was the HDW-F900 camcorder and the beginning of Sony's CineAlta™ revolution. Since that time, Sony CineAlta equipment has helped earn billions in box office sales and helped create countless primetime television dramas, comedies, mini-series and movies of the week.

CineAlta gear transformed moviemaking with real-time HD image evaluation on-set, instant replay of full-resolution digital “takes,” digital image optimization while shooting and 50-minute loads — all with significant cost benefits. The CineAlta system also provides a seamless bridge from 24p digital capture to 24-frame film distribution, giving each HD frame a one-to-one correspondence to a frame of film.

Over the years, Sony has enhanced the CineAlta line with the HDW-F900R. We've pursued full-bandwidth 4:4:4 image capture with the F23 and F35 cameras and the docking SRW-1 HDCAM SR™ field recorder. Now we've redefined digital cinematography with the one-piece HDCAM SR camcorder: the SRW-9000.

HDCAM SR™

CINEALTA™

SRW-9000: Quality meets creativity meets practicality

Now the glories of high-end production are dramatically more accessible. Sony started with the HDCAM SR technology that has helped directors of photography realize their vision in hundreds of motion pictures, television shows, commercials and music videos. Then we made it far smaller, easier to shoulder and easier to use. And we made it far more affordable. Here is the essence of the Sony F23 digital cinema camera and the docking SRW-1 HDCAM SR recorder brought together in a single, one-piece camcorder. Presenting the SRW-9000. The base model SRW-9000 offers HDCAM SR quality at lower cost than the original HDW-F900. And with current and future upgrades, the SRW-9000 will continue to grow along with your needs.

Unsurpassed image quality

The SRW-9000 excels in every dimension of image making: not only detail, but also exposure latitude, colorimetry, and contrast. It begins with three separate 2/3-inch imagers, a total of 6.6 million photosites that provide independent sensing of red, green and blue for each pixel. You'll thrill to over 12 stops of exposure latitude. These images are digitized at 14 bits capturing up to 800% dynamic range, then recorded in sumptuous 10-bit quality. You have a choice of 4:2:2 recording of Y/Cb/Cr signals. Or go beyond HD with full 4:4:4 RGB recording, using an optional plug-in board.

Upgrade path to 35mm PL mount

As the HDW-F900 demonstrated, Sony knows how to protect your investment, endowing camcorders with a long and productive life cycle. That's why we're planning a company first — an upgrade path that will enable today's SRW-9000 purchasers to retrofit their camcorders with a Super 35mm image sensor and PL lens mount. This extra-cost retrofit, planned to be available in the future, will mean that your HDCAM SR investment can evolve as your production needs evolve.

Upgrade path to file-based solid-state recording

While HDCAM SR tape-based production is now an industry touchstone, the SRW-9000 also anticipates superb file-based recording onto solid-state "SR memory" cards. Prototypes of this extra-cost option, planned to be available in the future, deliver superlative transfer rates of up to 6 Gigabits per second, suitable for the most demanding applications, including 3D 1080p and beyond.

Extraordinary creativity

Motion, exposure and time itself are yours to control with the SRW-9000. Even the base model gives you a choice of frame rates, including progressive recording all the way from 1080/23.98p to 1080/59.94p as well as interlace 1080/50i and 59.94i. Sony has scheduled a future software upgrade for 720/50p and 59.94p recording. You can also enjoy overcranking, undercranking, time lapse, speed ramps and breathtaking slow shutter effects with an optional plug-in board.

Proven practicality

The SRW-9000 takes full advantage of the thoroughly established, thoroughly proven HDCAM SR tape recording format, which enjoys an installed base of over 5,000 machines. Because so many major productions have been shot on HDCAM SR tapes, the decks are fixtures at leading post houses, digital intermediate houses and movie studios. The HDCAM SR format enables simple delivery of cassette tapes into postproduction — and simple duplication of original camera master tapes for archival and insurance backup.

With current and future upgrades, the SRW-9000 will continue to grow along with your needs.

Imagery to delight directors of photography

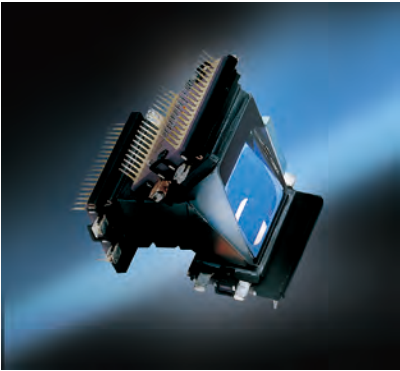
For years, Sony has been working closely with directors of photography to advance the capabilities of digital cinematography. We've listened carefully to cinematographers. And we've responded with successive improvements in exposure latitude, grayscale control, color refinement and sharpness. From candlelight to exterior day, from pyrotechnics to subtle skin tones, the SRW-9000 is a superlative story-telling tool.

Over 12 stops of exposure latitude

Many HD cameras are limited to 9 stops of exposure latitude, forcing cinematographers to compromise between blown-out highlights or crushed blacks. Sony's 14-bit analog-to-digital conversion preserves highlight detail up to 800% of nominal peak white. This endows the SRW-9000 with more than 12 stops of exposure latitude. So you can shoot challenging, high-contrast scenes — and create images that stand up better through vigorous post manipulation.

Uncompromised sharpness

The SRW-9000 incorporates the same three 2/3-inch CCD imager sensors as Sony's acclaimed F23 digital cinema camera. With separate image sensors for Red, Green, and Blue, there is no need for Bayer color filter arrays. And color values are never "interpolated" from neighboring pixels. The sensors provide the full resolution of the internationally standardized ITU Common Image Format (CIF) — 1920 x 1080 pixels — at picture rates of up to 60 progressive frames per second.



Incredibly low noise

While motion picture film is susceptible to grain, some digital cameras are susceptible to image noise, especially in deep shadows. Sony CineAlta cameras are legendary for "seeing" into the dark with phenomenally low noise. The SRW-9000 carries this tradition forward with a signal-to-noise ratio of 55 dB. This translates to extraordinarily clean imaging, even on exterior night shots. In film terms, sensitivity is superb — equivalent to ISO 580. In electronic terms, sensitivity is an ample F11 (23.98p mode, 2000 lux, 89.9% reflectance).

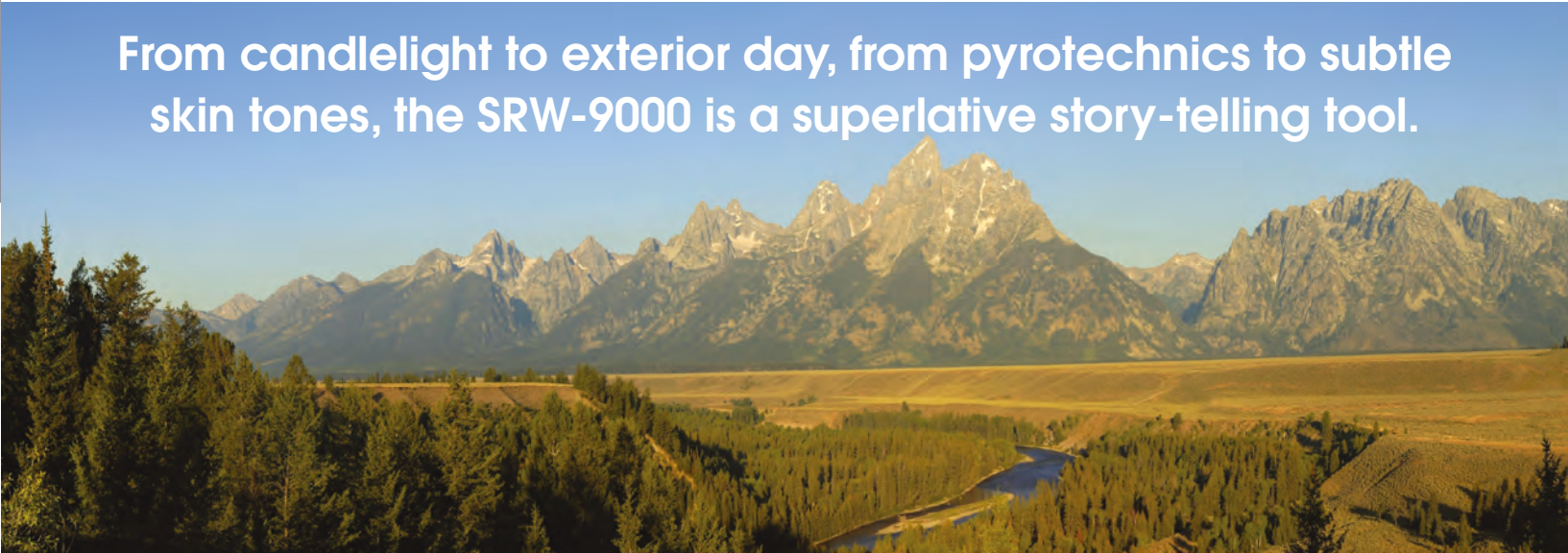
Choice of 2/3-inch cine and EFP lenses

Some of today's best cinematography lenses have been designed specifically for the 2/3-inch B4 mount. Zeiss, Canon, Fujinon and others have applied their expertise to produce exceptionally fast lenses. Many are engineered to maintain full MTF performance when wide open. In this way, cinematographers can enjoy the best of both worlds: controlled depth of focus from lenses that are also fast, small and light. Of course, the SRW-9000 also accepts the full range of Electronic Field Production (EFP) lenses, suitable for one-man on the run shooting. To better accommodate the weight of prime lenses and to assure consistent back focus, the SRW-9000 incorporates a rugged, reinforced B4 lens mount.

Choice of frame rates

Sony's original HDW-F900 established the idea of a multi-format camcorder, able to capture at a wide range of frame rates. Like the F900, the SRW-9000 records at 1080/23.98p, 24p, 25p and 29.97p, as well as 1080/50i and 59.94i. The SRW-9000 adds such cutting-edge capabilities as 1080/50p and 59.94p signals. In addition, 720/50p and 59.94p recording is planned as a future software upgrade.

From candlelight to exterior day, from pyrotechnics to subtle skin tones, the SRW-9000 is a superlative story-telling tool.



The practical performance of HDCAM SR recording

The SRW-9000 takes full advantage of Sony's HDCAM SR recording system, which has a track record of delivering spectacular results for the most demanding motion picture productions. HDCAM SR field recorders are often paired with both Sony and non-Sony digital cinema cameras. HDCAM SR studio decks are fixtures at major postproduction houses. All told, more than 5,000 HDCAM SR units are now in service worldwide.

Proven postproduction path

Unlike some systems, the SRW-9000 records onto compact, convenient, removable cassettes, suitable for program exchange or archiving. Generating backup copies of your original camera master is as simple as dubbing a cassette in real time. HDCAM SR material also plays back in real time without the need for de-Bayering or PC-based decompression. And HDCAM SR material is readily accepted by leading post, effects and digital intermediate houses.



Robust, vivid 10-bit imagery

The HDCAM SR format is Sony's finest recording system, delivering natural skin tones, rich color and exceptional resolution. While most HD is recorded at 100 megabits per second (Mbps) or less, the SRW-9000 captures at 440 Mbps for phenomenal detail, even when projected on a 70-foot screen. Instead of 8-bit precision, the SRW-9000 records 10-bit samples for exceptional tonal gradation. Instead of 4:2:0 or 4:1:1 color sampling, the SRW-9000 fulfills the ITU-R BT.709 standard, which specifies 4:2:2 sampling for vivid color rendition. The difference is profound, especially for projects that require broad latitude in postproduction.

MPEG-4 Simple Studio Profile

The HDCAM SR format takes advantage of MPEG-4 Simple Studio Profile (SSiP) processing that treats each progressive frame or interlaced field as its own, separate entity. A fleet of four Application Specific ICs (ASICs) analyzes picture content and applies a highly sophisticated encoding algorithm. The result is phenomenal picture quality at a reduced bitrate.

Optional 4:4:4 RGB recording at 440 or 880 Mbps

To excel in the most exacting bluescreen/greenscreen production, visual effects and aggressive color correction, the SRW-9000 offers the option of full-bandwidth, 4:4:4 RGB color sampling at either Standard Quality (SQ) 440 Mbps or the exceptional High Quality (HQ) 880 Mbps. Plug in the optional HKSR-9003 board to capture 4:4:4 signals that shine in demanding feature film, commercial and episodic TV productions. The HKSR-9003 also delivers the option of S-LOG Gamma recording to beautifully match other log-encoded material in the Digital Intermediate process.

Optional overcranking and undercranking

The SRW-9000 can put you in command of time itself with the optional HKSR-9002 plug-in Picture Cache board.* The board endows the SRW-9000 with a long list of soul-stirring effects, including overcranking and undercranking from 1 to 60 frames per second for gorgeous slow motion, bi-directional variable speed ramp effects, time lapse, and slow shutter for heightened motion blur. The HKSR-9002 also enables Loop Recording, to capture up to three seconds of events that occurred before you hit the REC button. By installing both the HKSR-9002 and HKSR-9003 plug-in boards, you can even capture these effects in full-bandwidth 4:4:4 color. Not only will the SRW-9000 capture these effects, the camcorder can also play them back in the field. So you can confirm that you've got exactly the shot you want before you strike the set.

*Planned to be available in 2010.

SRW-9000 Supported Recording Signal Formats

System Format		Recording Mode	Option
Signal Format	Frame Rate		
1080	4:2:2	59.94/50p	Double-data-rate (880 Mbps)
		30/29.97/25/24/23.98PsF 59.94/50i	Standard (440 Mbps)
	4:4:4 HQ	30/29.97/25/24/23.98PsF 59.94/50i	Double-data-rate (880 Mbps)
	4:4:4 SQ	30/29.97/25/24/23.98PsF 59.94/50i	Standard (440 Mbps)
720*	4:2:2	59.94/50p	Standard (440 Mbps)

*Planned to be available in 2010.

SRW-9000 Select FPS

Signal Format		Recording Frame Rate	Option	Slow Motion/Quick Motion	
1080	4:2:2	1 to 60 fps, 1 frame increments	HKSR-9002	23.98/24PsF:	0.40x to 24x
				25PsF:	0.42x to 25x
				29.97PsF:	0.50x to 30x
				50p:	0.83x to 50x
	4:4:4SQ	1 to 60 fps, 1 frame increments	HKSR-9002 and HKSR-9003	59.94p:	1.0x to 60x
				23.98/24PsF:	0.40x to 24x
				25PsF:	0.50x to 25x
	4:4:4HQ	1 to 30 fps, 1 frame increments	HKSR-9002 and HKSR-9003	29.97PsF:	0.50x to 30x
				23.98/24PsF:	0.80x to 24x
				25PsF:	0.83x to 25x
			29.97PsF:	1.0x to 30x	

Slow Motion/Quick Motion playback speed is approximate.

Choice of viewfinders

The SRW-9000 accepts three types of viewfinder, including the HDVF-20A/200, HDVF-C35W, and HDVF-C30WR. The newly introduced HDVF-C30WR offers improved focus assist, a color brightness level indicator, and pre-installed viewing LUTs (lookup tables) for S-LOG Gamma. It's the ideal complement to the S-LOG Gamma function of the optional HKSR-9003 plug-in board.



HDVF-C30WR

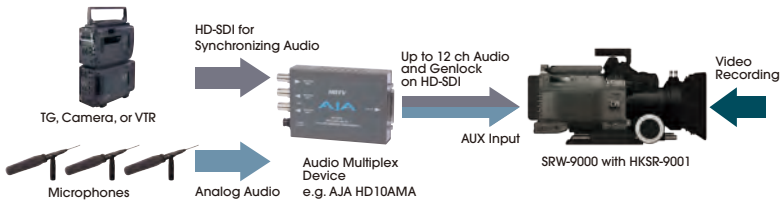
In-camera sound recording

In addition to spectacular images, the SRW-9000 can also capture two channels of audio feeds with superb 24-bit digital quantization and 48 kHz sampling.

Optional Dual Link output, Aux input

The HKSR-9001 HD-SDI Expansion Board provides dual-link HD-SDI outputs and an Auxiliary HD-SDI input. Dual-link HD-SDI supports full-bandwidth and high frame rate signals beyond the capability of single-link HD-SDI. These signals include 4:4:4 color and 1080/50p and 59.94p frame rates. The Aux input accommodates up to 12 channels of digital audio in conjunction with third party audio multiplexing devices.

a) Audio Multiplex With External HD-SDI Genlock



b) Audio Multiplex With HD-SDI Output



Long loads

The SRW-9000 records onto compact HDCAM SR™ cassette tapes, which become immediately available for push-button duplicating and program exchange — no data wrangling required. A single BCT-40SR tape can hold up to 50 minutes of content (at 24p in Normal Quality 4:2:2 mode).



On-board battery

In addition to DC power from external sources, the SRW-9000 can be driven from Sony's optional BP-GL95A on-board battery, which mounts directly to the camera chassis.



2-3 Pull-down, built-in down-conversion

A key advantage of the SRW-9000 is real-time, full-resolution monitoring. If your production style includes on-set monitoring, you can evaluate lighting, set design, wardrobe, hair and makeup at full resolution, in vivid color. Monitoring options include 2-3 pulldown from 24p recording to 60i display and down-conversion from HD recording to SD monitors.

SRW-9000 Signal Output Format

System Format		Dual-link HD-SDI (HKSR-9001)		HD-SDI Monitor	Test (VBS)
Signal Format	Frame Rate				
1080	4:2:2	23.98PsF	1080/4:2:2/23.98PsF*1	1080/4:2:2/23.98PsF	525/59.94i
		24PsF	1080/4:2:2/24PsF*1	1080/4:2:2/24PsF	625/50i
		25PsF	1080/4:2:2/25PsF*1	1080/4:2:2/25PsF	625/50i
		29.97PsF	1080/4:2:2/29.97PsF*1	1080/4:2:2/29.97PsF	525/59.94i
		50i	1080/4:2:2/50i*1	1080/4:2:2/50i	625/50i
		59.94i	1080/4:2:2/59.94i*1	1080/4:2:2/59.94i	525/59.94i
	4:4:4 SQ/HQ*2	50p	1080/4:2:2/50p	1080/4:2:2/50i	625/50i
		59.94p	1080/4:2:2/59.94p	1080/4:2:2/59.94i	525/59.94i
		23.98PsF	1080/4:4:4/23.98PsF	1080/4:2:2/23.98PsF	525/59.94i
		24PsF	1080/4:4:4/24PsF	1080/4:2:2/24PsF	625/50i
		25PsF	1080/4:4:4/25PsF	1080/4:2:2/25PsF	625/50i
		29.97PsF	1080/4:4:4/29.97PsF	1080/4:2:2/29.97PsF	525/59.94i

*1 Single-link. HD-SDI Output A and B output the same signal.

*2 Requires optional HKSR-9003 board.

Well-balanced shooting

While the SRW-9000 gracefully accommodates cranes, jibs, tripod and Steadicam mounting, it was designed from the outset for handheld shooting. It's not by accident that the camera sits comfortably on the shoulder with the weight of most lenses balanced by the battery in back. And it's no surprise that the principal controls fall naturally to hand.

Wide range of accessories

The SRW-9000 is compatible with a wide range of accessories for the HDW-F900, F23, SRW-1, and ARRI.

Optional Assistant Panel

To enhance operational flexibility, the SRW-9000 accepts an optional Assistant Panel wired remote control. This duplicates the camera body's buttons and Electro-Luminescent display, making it easy to set frame rates, shutter and gain and to trigger recording from a distance of up to two meters (six feet).



Real-time image enhancement

Traditional film cinematography creates the image with set design, lighting and filtration in front of the lens. The SRW-9000 augments these techniques with a wide range of creative image enhancements behind the lens. At your option, you can create a specific “look” with in-camera settings and evaluate that look through real-time monitoring on the set.

Multi-Matrix Control

If you prefer to refine the “look” of a scene in-camera, the SRW-9000 empowers you with adjustments similar to secondary color correction. Multi-Matrix control adjusts the hue and saturation of 16 individual color ranges, each roughly 20 degrees on the vector scope. These adjustments are performed at full bit depth.

Sony HyperGamma curves

A key concern in digital cinematography is the ability of the camera to handle the full range of illumination in high contrast scenes. Sony captures grayscale from the deepest shadows to the brightest specular highlights with an extended series of eight preset HyperGamma curves, four of which are optimized to take advantage of the full 800% dynamic range of the sensors.

Customizable gamma curves

The SRW-9000 also empowers you to customize gamma curves with supplied CVPFileEditor™ software for Windows® PCs. An easy graphic user interface enables you to change the shape of the gamma curve, then load your curve into the camera via Memory Stick PRO™ media.

Optional S-LOG Gamma

A feature of the optional HKSR-9003 RGB 4:4:4 Processing Board, S-LOG Gamma mimics the tonal response of a film negative, so you retain full flexibility in color correction and a seamless workflow with postproduction facilities geared toward LOG encoded material. The optional HDVF-C30WR viewfinder even includes pre-installed viewing LUTs (lookup tables) for S-LOG Gamma.

At your option, you can create a specific ‘look’ with in-camera settings and evaluate that look through real-time monitoring on the set.

Optional Accessories

 HKSR-9001 HD-SDI Expansion Board	 HKSR-9002*1 Picture Cache Board	 HKSR-9003 RGB4:4:4 Processor Board	 AP-1 Assistant Panel	 BCT-6SR/33SR/40SR HDCAM SR Videocassette Tapes
 HDVF-C30WR HD Electronic Viewfinder	 HDVF-C35W 3.5-inch*2 LCD Color Viewfinder	 HDVF-20A/200 2.0-inch*2 CRT Viewfinder (Photo shows HDVF-20A)	 BP-GL95A Lithium-ion Battery Pack	 BC-L160 Battery Charger
 BC-L70 Battery Charger	 AC-DN10/DN2B AC Adaptor (Photo shows AC-DN10)	 RM-B750 Remote Control Unit	 RM-B150 Remote Control Unit	 WRR-861B/862B*3 Wireless Microphone Receiver (Photo shows WRR-862B)
 ECM-678/674 Shotgun-type Electret Condenser Microphone (Photo shows ECM-678)	 VCT-14 Tripod Adaptor	 CAC-12 Mic Holder	 LUMA Series Professional LCD Monitor	 TRIMASTER Series Professional Master Monitor

*1 Planned to be available in the first half of 2010. *2 Viewable area measured diagonally. *3 Requires optional mounting bracket (A-8278-057-B)

Optional Accessories From Other Manufacturers

<div>ARRI</div> <div></div> <div>BP-8 Bridge Plate</div>	<div></div> <div>MB-20 Matte Box</div>		<div>AJA</div> <div></div> <div>HD10AMA HD/SD 4-Ch Analog Embedder/Disembedder</div>
<div>Carl Zeiss</div> <div></div> <div>DIGIPRIME Lenses</div>	<div></div> <div>DIGIZOOM Lenses</div>	<div></div> <div>SHARPMAX</div>	
<div>Canon</div> <div></div> <div>HD-EC Prime Lenses FJs Series</div>	<div></div> <div>HD-EC Zoom Lens HJ21x7.5B KLL-SC</div>	<div></div> <div>HD-EC Zoom Lens HJ11x4.7B KLL-SC</div>	<div></div> <div>HD-EC Zoom Lens HJ8x5.5 KLL-SC</div>
<div>Fujinon</div> <div></div> <div>HD CINE SUPER ZOOM/ Prime Lenses</div>	<div></div> <div>HD CINE COMPACT C Lens HAc 13x4.5</div>	<div></div> <div>HD CINE COMPACT C Lens HAc 15x7.3</div>	<div></div> <div>HD CINE COMPACT C Lens HAc 18x7.6</div>

For details, please contact each manufacturer.



Specifications

General	
Dimensions	148 x 211 x 330 mm (5 7/8 x 8 3/8 x 13 inches) (without handle and protruding parts)
Mass	Approx. 6.5 kg (14 lb 5 oz)
Power requirements	DC 12 V +5.0 V/-1.0 V
Power consumption	Approx. 57 W (while recording, w/o options, power save mode)
Operating temperature	0°C to 40°C (32°F to 104°F)
Storage temperature	-20°C to +60°C (-4°F to +140°F)
Humidity	10% to 90% (relative humidity)
Continuous operating time	Approx. 80 min w/BP-GL95A battery
Recording format	Video: HDCAM SR 440 Mbps, HDCAM SR 880 Mbps Color Space: 4:2:2, 4:4:4SQ, 4:4:4HQ (w/HKSR-9003) Audio: 12 ch/24 bit/48 kHz
Recording/Playback time	HDCAM SR 440 Mbps: 4:2:2, 4:4:4SQ: 40 min (30p), 50 min (24p) HDCAM SR 880 Mbps: 4:4:4HQ: 20 min (30p), 25 min (24p), 4:2:2, 4:4:4SQ: 20min (60p), 24 min (50p)
Recommended tape	BCT-6SR, BCT-33SR, BCT-40SR
Inputs/Outputs	
GENLOCK IN	BNC (x1), 1.0 Vp-p, 75 Ohm
TC IN	BNC (x1), 0.5 to 18 Vp-p, 10 Ohm
AUDIO IN	CH-1/CH-2: XLR-type 3-pin (female) (x2), Line/Mic/Mic +48 V selectable
AUX IN	BNC (x1 w/HKSR-9001), SMPTE 292M (12 channel embedded audio)
TEST OUT	BNC (x1), (switchable), HD Y/ SD composite (character On/Off)
HD-SDI Monitor	BNC (x2), HD-SDI SMPTE 292M (w/embedded audio) (character On/Off)
HD-SDI OUT (Dual Link)	BNC (x2), (w/HKSR-9001 option) HD-SDI OUT LinkA/B HD-SDI: SMPTE 292M (w/embedded audio) HD-SDI Dual Link: SMPTE 372M (w/embedded audio)
TC OUT	BNC (x1), 1.8 Vp-p, 1 kOhm
EARPHONE	Mini-jack (x1), (stereo)
DC IN	XLR-type 4-pin (male) (x1), 11 to 17 V
DC OUT	4-pin (x1), (for wireless microphone receiver), 11 to 17 V DC (MAX 0.5 A)
LENS	12-pin (x1)
REMOTE	8-pin (x1)
EXT IO	5-pin (x1), camera control (RS-232C)
CTRL (CAM)	(x1), for assistant panel (AP-1)
MEMORY STICK	(x2), for camera setup files, VTR maintenance
Audio Performance	
Frequency response	20 Hz to 20 kHz, +0.5 dB/-1.0 dB
Dynamic range	More than 100 dB
Distortion	Less than 0.05% (at 1 kHz, reference level)
Crosstalk	Less than -80 dB (at 1 kHz, reference level)
Headroom	20 dB
Camera Section	
Pickup device	3-chip 2/3-inch type Progressive CCD
Effective picture elements	1920 (H) x 1080 (V)
Optical system	F1.4 prism
Built-in optical filters	A: 3200K, B: 4300K, C: 5600K, D: 6300K, E: ND0.3 (1/2ND) 1: Clear, 2: ND0.6 (1/4ND), 3: ND1.2 (1/16ND), 4: ND1.8 (1/64ND), 5: CAP
Shutter speed	angle 360.0°~ 4.3° Continuous Mode (ECS)
SR Motion variable frame rate	(w/HKSR-9002*) Selectable from 1 to 60 frame/sec as recording frame rate
Lens mount	Special made rugged 2/3-inch type Sony bayonet mount (B4)
Sensitivity (2000 lx, 89.9% reflectance)	23.98/24/29.97PsF; T11; ISO 580
Gain selection	-6, -3, 0, 3, 6, 9, 12 dB
Smear level	-135 dB (typical)
S/N ratio	55 dB
Horizontal resolution	1,000 TV lines (at center of screen) 5% or higher modulation
Registration	Within 0.02% (all zones, without lens)
Viewfinder	
	Optional
Supplied Accessories	
	Operation manual (1), Lens mount cap (1), RiserPlate (1), V Plate, Handle, Control Panel, Control Panel cable (L,M)

*Planned to be available in the first half of 2010.

SONY®

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